Neuse River Riparian Buffer

Case Study

Alexander Family Property

US70/Yeargan Road

Garner, NC

1/14/2014

by

Art Alexander

History

In 1930, Granddaddy bought approximately 25 acres on Loop Road (now called Yeargan Road) between Raleigh and Garner.

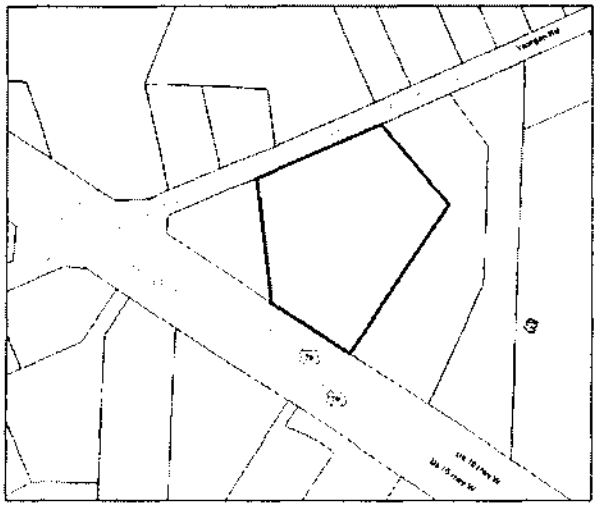
When granddaddy bought the property

- US 70 did not exist (line and notation on map indicate proposed location)
- "Old Garner Road" was the main highway from Raleigh to Garner
- NC50 (Benson Highway) had not been constructed
- Yeargan Road (then Loop Road) was a dirt road with little traffic
- Most of area was farm land and forest

1938 Aerial Photograph (red outline approximates boundaries of original property)
Source: USDA Historical Aerial Photos BOP_13_204_Wake_4-24-1938.tif

Our focus today is on a single, 4.33 Acre Parcel that was part of that property @Yeargan Road & US70 West in Garner.

Here's a close-up view to help better establish the 4.33 acre parcel that is the subject of the rest of this presentation.



In 1950, my father and my uncle bought lots and built houses beside each other, just up the road from Granddaddy's property. There were no children my age nearby, so I spent most of my time playing in Granddaddy's woods with my dog. There was a small stream that sometimes had water in it, but never had any fish.

There was also a ditch that ran from the edge of Loop Road into the woods near Granddaddy's house. Remember this key point.

This little 3 year old farmer is kind of cute, but the real reason for including this photo is to help illustrate the character of Loop Road in the 1950s and the nature of the drainage ditches that ran along it.

This photo was shot in front of our house, on Loop Road, just north of the ditch area.

Note the size and depth of the ditch running beside the road. This ditch and the one on the other side of the road are the primary source of drainage into the ditch on granddaddy's property.

1959 Aerial Photograph

Ditch is clearly visible, dug straight into property, and then stops abruptly.

This is the ditch on Granddaddy's property that I remember from playing in those woods as a boy. It was approximately 3 feet wide and 18 inches deep. It intersected with the ditch that ran along the south shoulder of Loop Road, then ran straight back into the woods on the property where it stopped abruptly. (See red arrows)

Rainwater runoff from Loop Road was the primary source of water into this ditch. It was a dry bed most of the year.

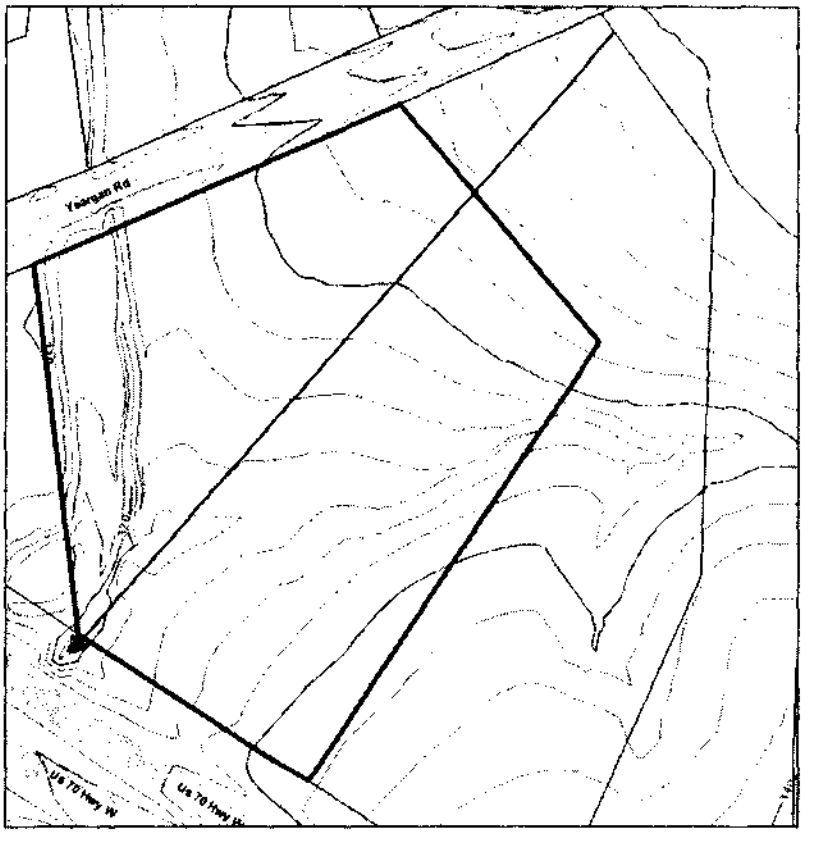
A light rain might fill the ditch, where the water would then stand until it evaporated.

Heavier downpours could cause the ditch to overflow onto the lower areas of the property to the south.

Source: USDA Historical Aerial Photos 6W_153.tif
http://www2.lib.unc.edu/reference/gis/USDA/wake_1959/index.html

The natural slope of the land is from the northeast along Loop Road toward the southwest at US70.

Since the path of the ditch cut across the natural slope, there was no natural path for the excess water to follow. It overflowed, across the surface of the surrounding forest floor, slowly seeping into the low lying areas. There it sat until it was absorbed by the soil or until it eventually found its way into the ephemeral stream farther south on the property.



I do not know who originally dug this ditch onto the property. It could have been dug by the farmer who owned the property to help drain some portion of the land. However, I suspect that it was dug somewhere along the way by NCDOT as part of an improvement on the dirt road.

Whenever it happened, the ditch's excess runoff was a constant irritation to my father, who inherited the lot when my grandfather died in 1959.

Too many times to count, when we were driving past that ditch on our way home, he'd voice his frustration, "Blasted county! Dug that ditch into my property, dumping the water in there, turning it into a swamp."

He was exaggerating a bit on the "swamp" part, but it was true that the water overflowing the ditch into the lower areas did have the tendency to make that lower portion wetter than it normally would have been.

He was particularly irritated when it came time to pay the property taxes. He felt that the ditch and the water it channeled into the property had devalued the property, but that didn't stop the taxes from going up.

Finally, when I was in college (I don't remember exactly when, but in the late 60's or early 70's) I called the county and explained the situation. As a result of that call, someone (county or DOT) brought a backhoe out and dug out the ditch deeper and wider—and all the way from its source on Yeargan Road to near US70, where they channeled it into the natural bed of the ephemeral stream.

The modification came as a bit of a surprise. As far as I remember, there was no real notification of what they planned to do or when they were going to do it. One day it wasn't there, the next day we drove by and it was done.

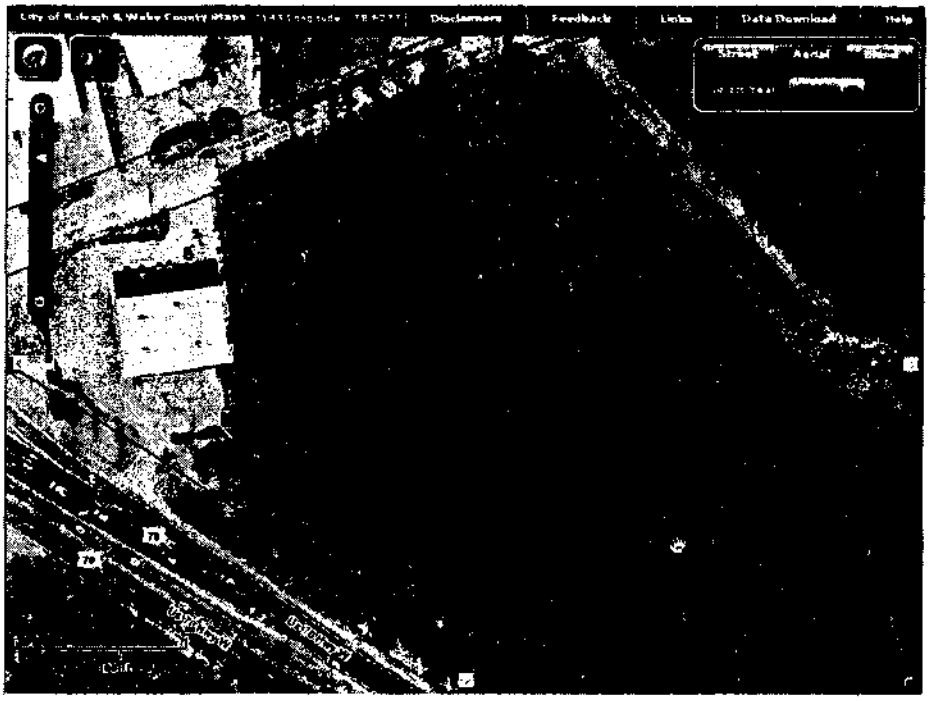
Honestly, the result was overkill in a big way. Instead of the original 3 feet wide by 18 inch deep ditch running 100 or so feet into the property, we now had an 8 foot wide, 6 feet deep ditch running over 350 feet through it.

We didn't complain, because it did take care of the low wet area and it didn't cost us anything. We rationalized that we would someday pipe the ditch and fill in the gash anyway. So we let it go.

If we'd only known the problems that casual action would cause years later, we'd have never started it.

My family was not experienced in real estate development, but automatic rezoning by the Town of Garner to commercial status and ever rising taxes forced us to take that path to be able to pay the taxes.

Every year since 1930, my family has paid property taxes on this property.



Since 1994, my parents have paid over $100,000 in property taxes on this single, 4.33 acre lot.

In 2008 alone, my 87 year old mother paid $14,868.71!

Consider how much my family has paid on the entire 25 original acres since 1930.

Enter the Neuse River Riparian Buffer

- I first found out about the Neuse River Buffer in early 2008, almost 11 years after our property had been devalued by it.
- We were approached by a local realtor with an offer to purchase the property—<u>an offer that was half the tax value of the property</u>.
- The offer startled me. When I asked why so low, I was told "the Neuse River Buffer".
- What I also learned was that the Wake County Tax Assessor did not factor in any property devaluation when the rule went into effect.
- Instead of going down, the property tax went up in 1999, again in 2000, and again in 2002, and 2003, 2006, 2007, 2008....all years in which the property value had actually gone down because of the buffer regulation that we didn't even know existed!

Neuse River Buffer

15A NCAC 02B .0233 North Carolina Administrative Code – Neuse River Riparian Buffer Rules

Establishes a *"50-foot wide riparian buffers directly adjacent to surface waters in the Neuse River Basin"*

It further defines the feature to be subject to the rule if

"a surface water shall be present if the feature is approximately shown on either the most recent version of the:

- ***USDA soil survey map***
- ***USGS 1:24,000 scale (7.5 minute) quadrangle topographic maps***

This "rule" went into effect July 22, 1997.

- Before the rule went into effect, no letters were mailed to the landowners whose properties would be devalued by the rule.
- I am told by DWQ that it was advertised in the newspaper.
- If the Town of Garner has plans for a project that will have a substantial effect on individual property rights, they send a letter to the owners that will be affected; and they schedule meetings for public discussion of the related issues.
- Just last week in fact, the Town of Cary sent me a letter informing me they will be doing some maintenance work on a sewer easement that runs through my property. They thought this was important enough for a letter.
- **Yet the State of North Carolina did not think that we deserved a letter telling us that they were about to turn a substantial portion of our property into a conservation buffer *that we could never use again*. Curious isn't it.**

Here is what John C. Cooke, a prominent local Land Use attorney and author of the "North Carolina Land Use Litigator" said about the Neuse River Buffer in a 1998 article:

> *"Unrecognized by most property owners, lenders and real estate professionals, a conservation buffer was instantaneously created by operation of law on virtually every medium to large sized tract of nonurban property located in the Neuse River Basin on July 22, 1997.*
>
> *This transfer of private property rights to the public for the public's good has had and will have a substantial impact on land values."* -John C. Cooke, Womble Carlyle Sandridge & Rice, PLLC

Source: *"The Neuse River Buffer Rules Alter Land Values in North Carolina"* by John C. Cooke
http://library.findlaw.com/1999/Jan/1/129292.html

Neuse River Riparian Buffer Rules also say:

> "Surface waters that appear on the maps shall **not** be subject to this Rule if an on-site determination shows that they fall into one of the following categories.
>
> (i) **Ditches** and manmade conveyances other than modified natural streams unless constructed for navigation or boat access." **-15A NCAC 02B .0233**

Remember when I told you about the ditch on the property when I was a boy? Ditches are exempt from buffer rules regulation.

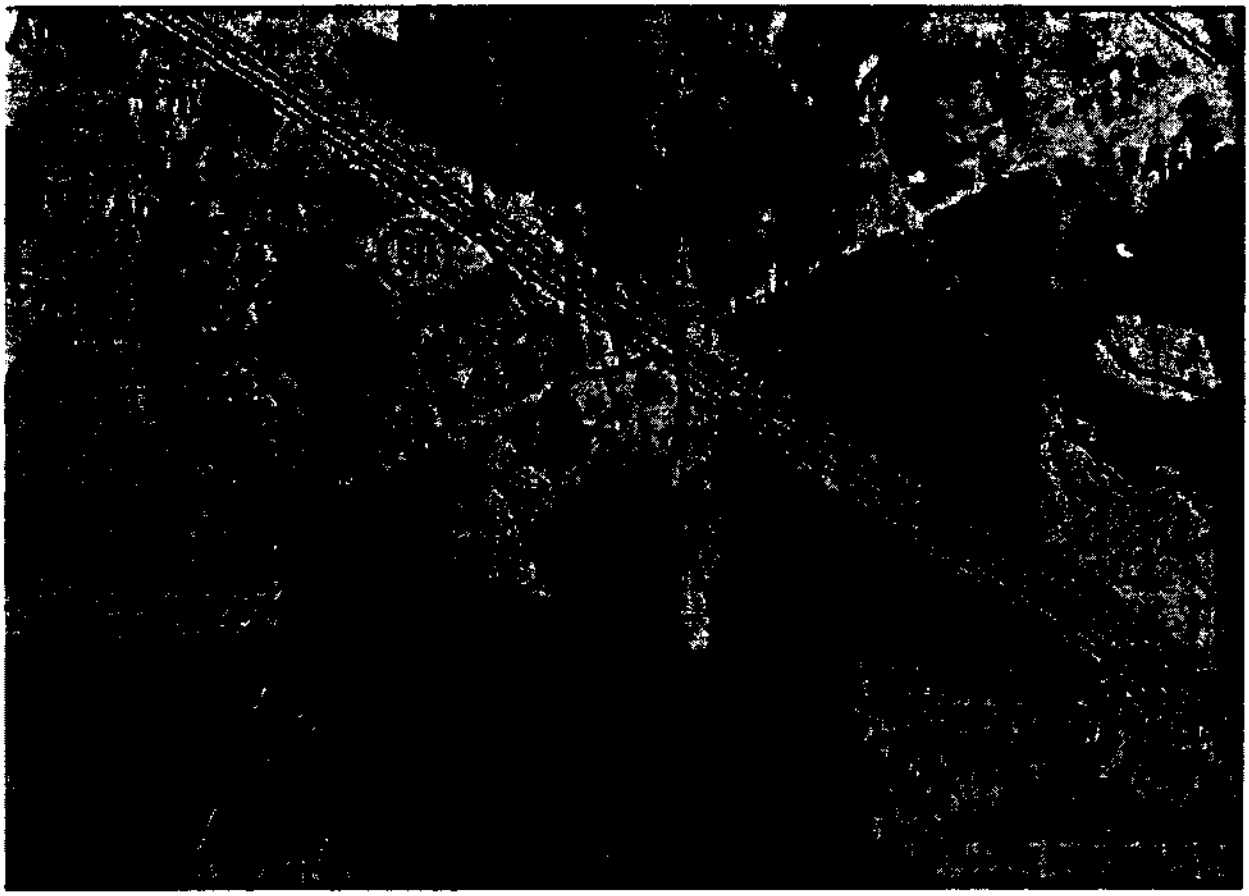
The issue of whether the feature is a ditch or a stream is a key point.

I have maintained from my very first meeting with NCDWQ that the feature in question on our property is a **ditch**--not a stream.

NCDWQ maintains that it is a modified natural stream, because *"the feature is approximately shown on ... the NC Soil Map..."*.

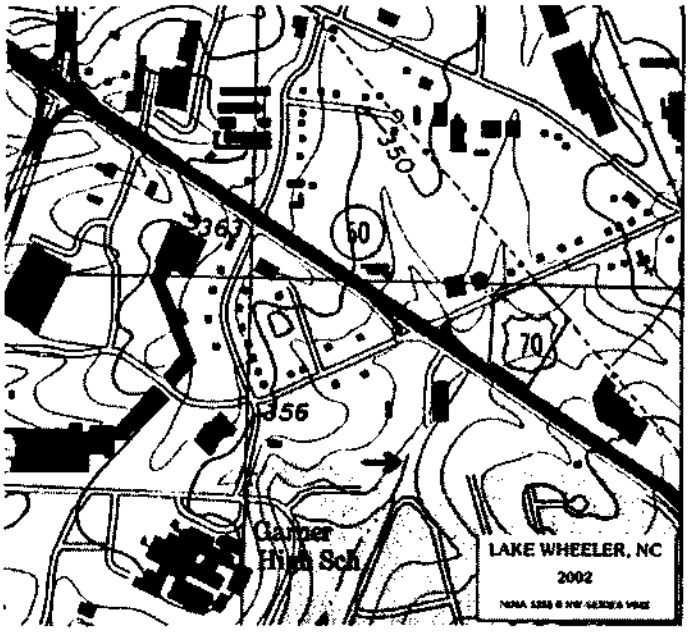
1970 USDA Wake County Soil Survey Map

Here is an image of the 1970 USDA Soil Survey Map. The dash-dotted line is the indicator used for *"unclassified intermittent streams"*, the lowest classification notated on these maps.



Source: 1970 USDA Soil Survey for Wake County NC

2002 USGS Map Lake Wheeler Quadrangle (this was the "current" map at the time of our property evaluation)



No stream on our property.

The stream begins south of US70, after flowing *under* Garner TV & Appliance building.

However, the 1998 version of the USGS map shows a stream beginning at Yeargan Road and crossing our property.

This leads us to the issue of the inaccuracy of these maps.

NCDWQ uses these maps as the basis of their regulation. However, when discussing the validity of these maps in a different forum, NCDWQ emphasizes the ***inaccuracy*** of these maps for regulatory purposes.

Topographic and Soil Maps Do Not Accurately Depict Headwater Stream Networks

By Thomas Colson, James Gregory, John Dorney, and Periann Russell

Topographic and soil maps are often used to determine the location of headwater stream corridors for federal and state planning and regulatory purposes. Yet these maps are often inaccurate, raising serious questions about their use in regulatory applications.

Headwater streams are the first- and second-order intermittent or perennial streams throughout a watershed that serve as a critical hydrologic link between the surrounding landscape and the larger, connecting stream outflows (Stanford, 1996). Small first-order streams can represent up to 85% of the drainage network (Peterson et al., 2001) and often drain a major portion of the watershed area (McGlynn and Seibert, 2002).

Federal and state water quality programs designed to protect the ecological functions of headwater stream corridors often utilize U.S. Geological Survey (USGS) topographic maps, with a 1:24,000 scale, to determine the location of headwater streams for planning and regulatory purposes. The significant nexus assessments now required by the U.S. Army Corps of Engineers for "waters of the United States" determinations often focus on small streams and the hydrologic/ecologic connections of those streams to wetlands and to the nearest downstream ond-, and, sometimes, third-order streams. John Dorney and staff of the Wetlands and Stormwater Branch of the North Carolina Division of Water Quality (NCDWQ) manage the state's riparian buffer rule program. Given the stream mapping errors and the fact that the inaccurate maps were being used for planning and regulatory purposes, John Dorney, with assistance from James Gregory, set out to develop a field methodology for identifying the origins of first-order streams (NCDWQ, 2005) and to initiate research on the nature and extent of stream mapping errors. The NCDWQ methods for identifying the origins of intermittent and perennial streams were implemented in early 1999 and have been extensively tested across North Carolina and in several other states. The methods are used in North Carolina for the riparian buffer rules and other regulatory applications as well as for field mapping of headwater streams to determine map errors. For an extensive literature review on stream mapping standards and map errors in depic-

This paper was co-authored by Periann Russell, one of the people who did a site inspection of our property for NCDWQ.

"Topographic and soil maps are often used to determine the location of headwater stream corridors for federal and state planning and regulatory purposes. Yet these maps are often inaccurate, raising serious questions about their use in regulatory applications."

"data showed that NRCS* soil maps usually overestimate the presence of small streams."

Numerous other scientific studies have determined that USGS maps and NRCS Soil Maps are not suitable for regulatory purposes.

STREAM NETWORK DELINEATION FROM HIGH-RESOLUTION DIGITAL ELEVATION MODELS

by

THOMAS PAYTON COLSON

A dissertation submitted to the Graduate Faculty of
North Carolina State University
in partial fulfillment of the
requirements for the Degree of
Doctor of Philosophy

FORESTRY

Raleigh. North Carolina

2006

"The county GIS data for Wake Person Counties included a large number of stream lines upstream from the observed intermittent or perennial stream origins, indicating that

"a substantial number of ephemeral streams are included on these data sets."

"The Wake county criterion for a stream is based on visual inspection of high resolution aerial photography; a stream is included whenever a visible channel is present."

"This approach apparently leads to inclusion of those ephemeral streams that erode sufficiently to create a visible channel, ***although other criteria listed in the NCDWQ stream origin definition are not met."***

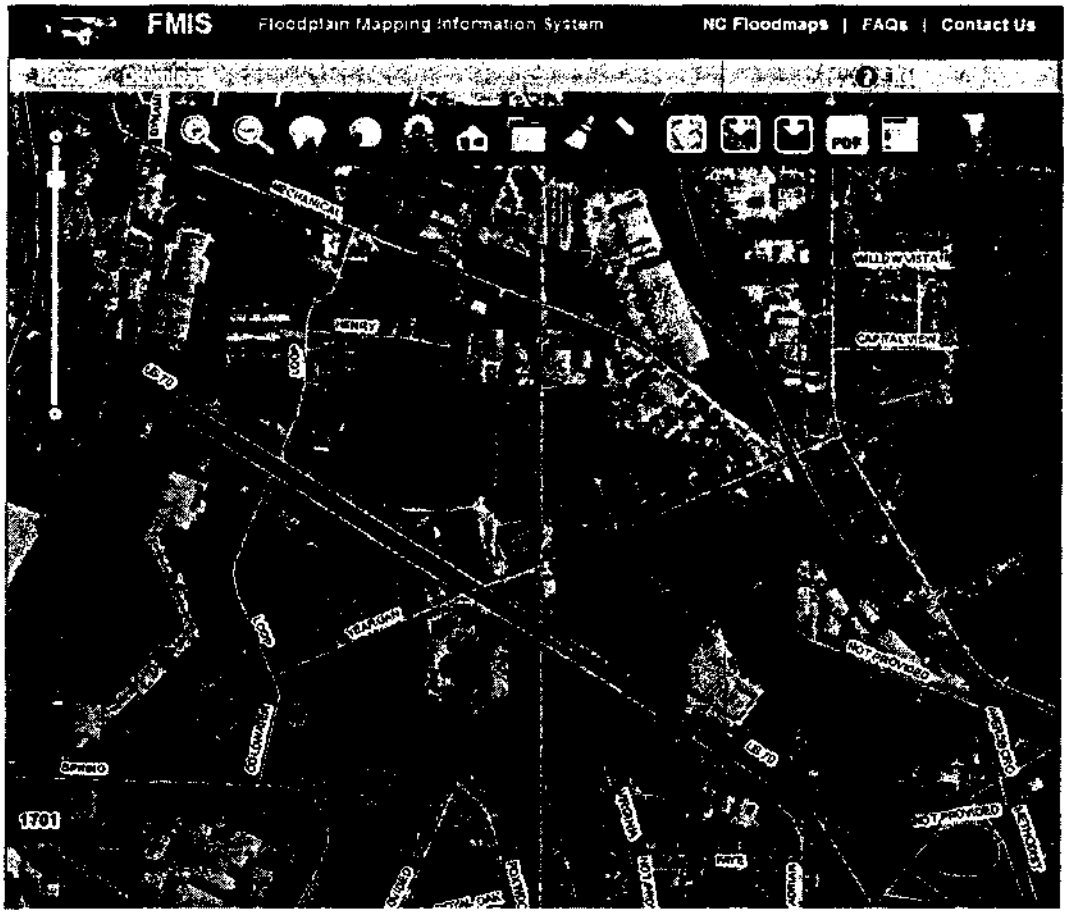
"The stream networks depicted on soil maps also contained a high number of first order channels, indicating inclusion of ephemeral streams..."

"Stream networks were included on USGS topographic maps and NRCS soil maps for different purposes and drawn with different standards."

"Their suitability in accurately representing headwater streams needs to be carefully assessed before these maps are used for purposes other than their primary application, ***which does not include,*** *for example,* ***determination of the applicability of riparian buffer rules to a 300 m long 1st order stream."***

"Many environmental management functions in North Carolina, such as calculating stream length for hydrologic modeling and riparian buffer protection, rely upon outdated paper maps such as the USGS topographic map series for the determination of the location of stream "blue lines". ***These cartographic products are inadequate for use in headwater stream mapping..."***

Light Detection and Ranging (LiDAR) the North Carolina Floodplain Mapping Information System.



The LiDAR based map of the NCFMIS *places the stream origin south of US70*, near the point where it flows out from underneath the Garner TV & Appliance building—*virtually the same point as on the 2002 USGS Map*.

Source: NC Floodplain Mapping Program – Floodplain Mapping Information System (FMIS)

Is it a Ditch or a Stream?

Definitions

- ***'Stream'*** *- a body of concentrated flowing water in a natural low area or natural channel on the land surface. [15A NCAC 02B .0233(2)(k)]*
- ***'Ditch or canal'*** *- a man-made channel other than a modified natural stream constructed for drainage purposes that is typically dug through inter-stream divide areas. A ditch or canal may have flows that are perennial, intermittent, or ephemeral and may exhibit hydrological and biological characteristics similar to perennial or intermittent streams. [15A NCAC 02B .0233(2)(c)]*

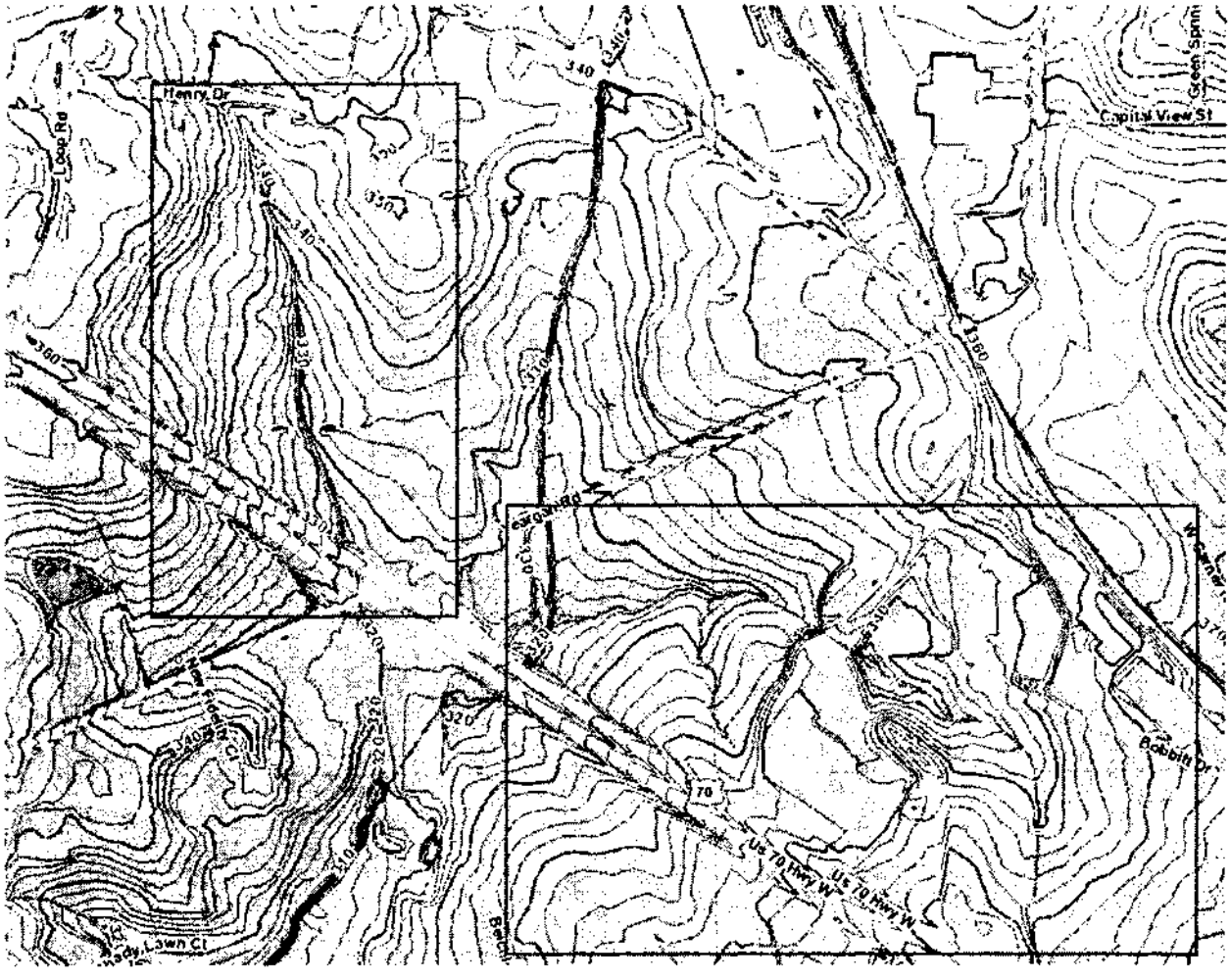
Source "NCDWQ: Methodology for Identification of Intermittent and Perennial Streams and Their Origins"

The following is from the NCDWQ Stream Identification Manual, under "Techniques to help make the distinction between a ditch and a natural stream":

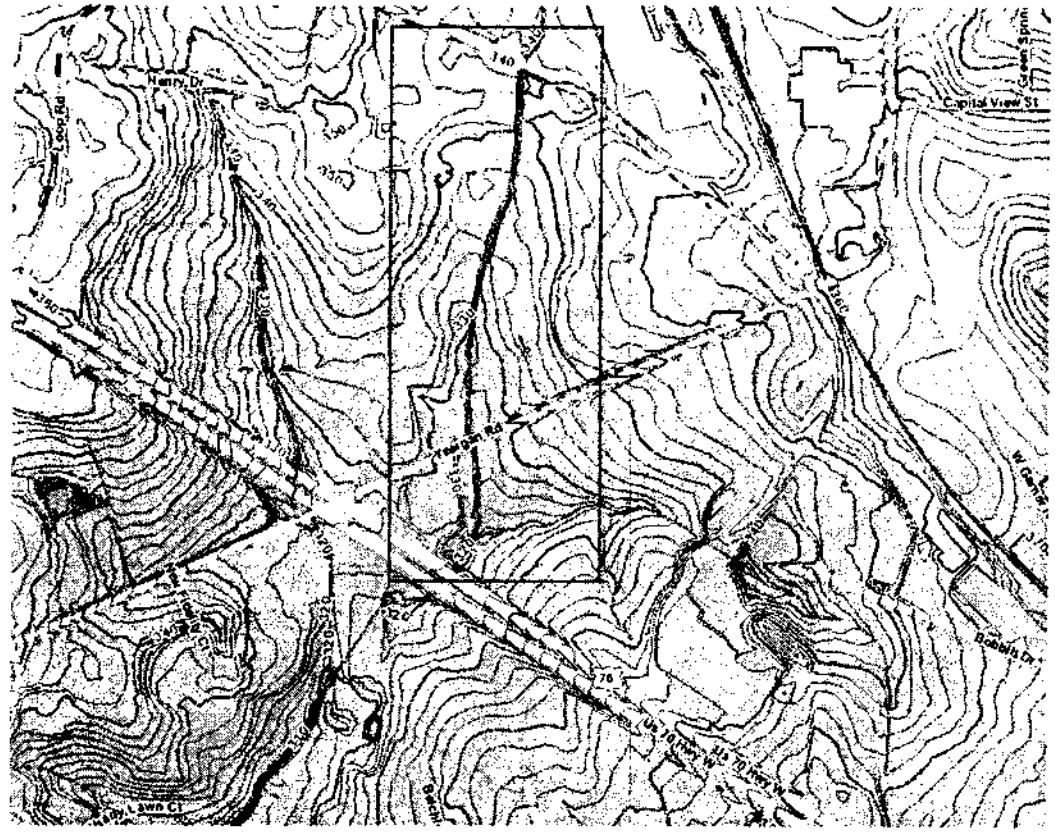
- *The topographic lines depicted on a USGS topographic map may indicate a natural valley in which a natural stream could be present. Parallel topographic contour crenulations (v-shaped contour lines) with angles of 90° or less can be indicative of the presence of a stream.*
- *Features located outside of a natural crenulation may not be natural.*

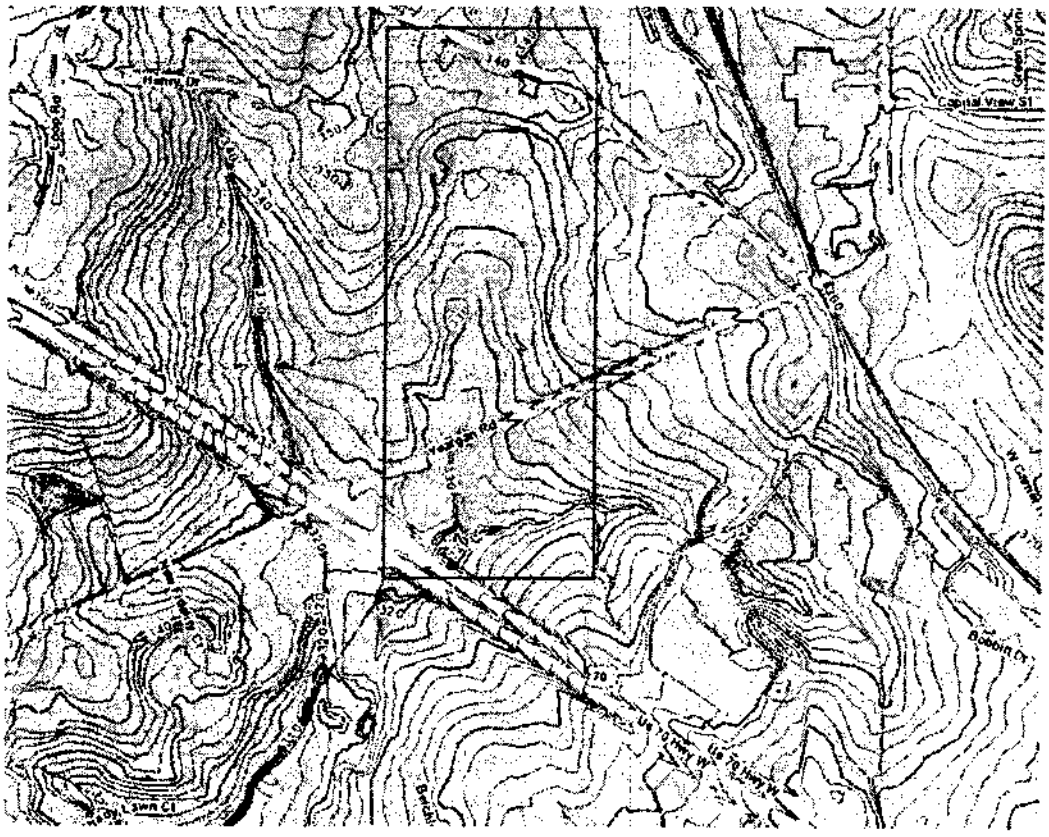
Topographic Evidence of a Natural Stream

"Parallel topographic contour crenulations (V-shaped contour lines) with angles of 90° or less can be indicative of the presence of a stream"



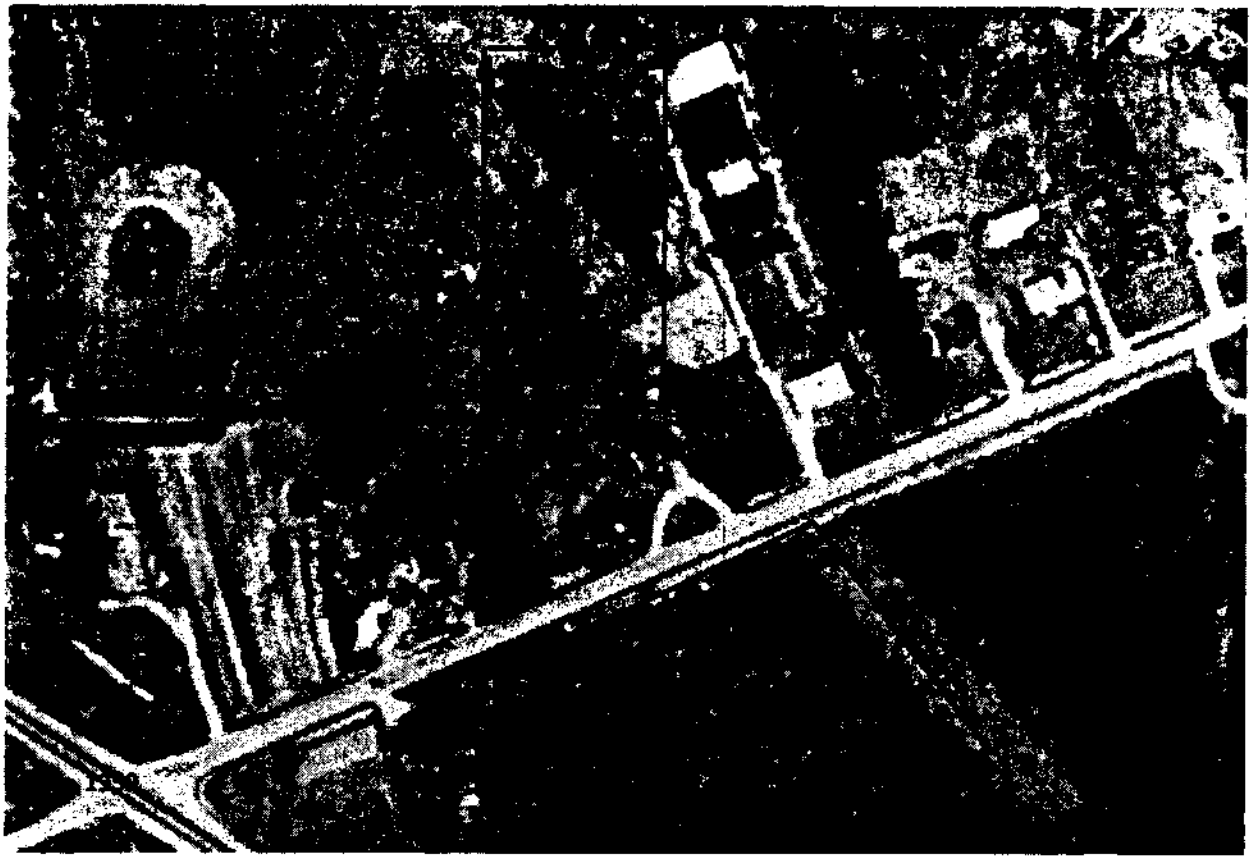
*Features located outside of a natural crenulation may **not** be **natural**"*





Is there physical evidence to support a natural stream in this location?

1959 Aerial Image of Area Upslope from Ditch on Our Property

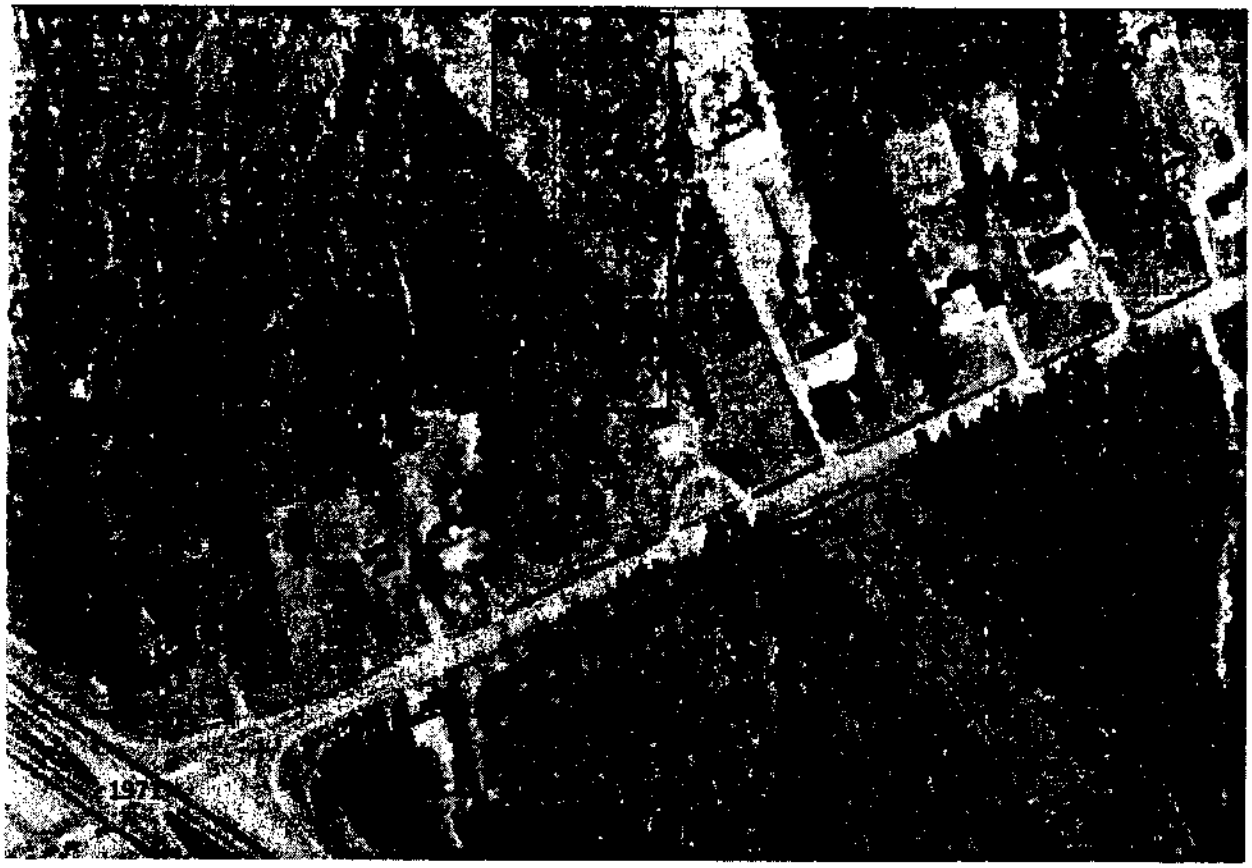


There is no visual evidence of any water channel upslope of our property--neither ditch nor stream.

By comparison, note the clear evidence of the ephemeral stream channel in the power line on the lower right edge of the photograph. Proof that this resolution is sufficient to see surface stream features if they existed.

Source: USDA Historical Aerial Photos 6W_153.tif

1971 Aerial Image of Area Upslope from Ditch on Our Property



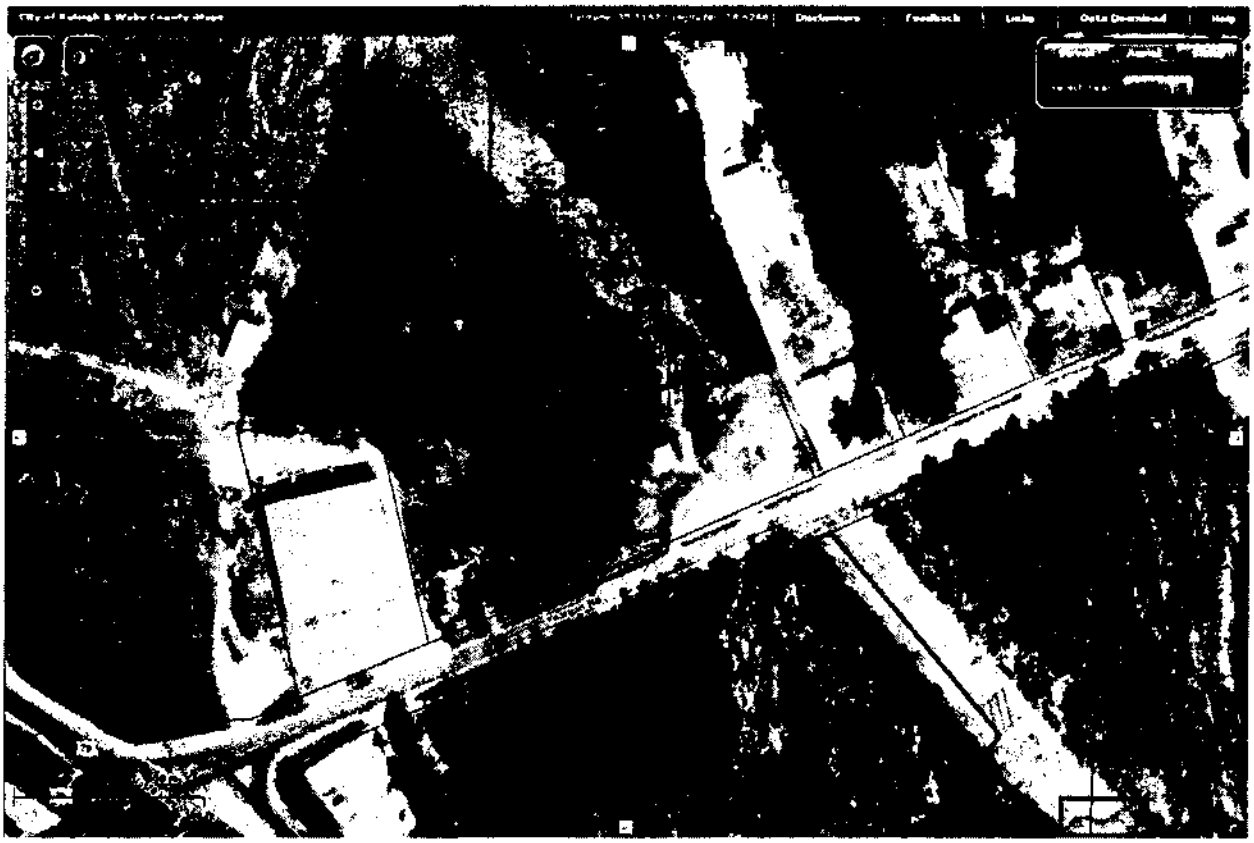
12 years later, higher resolution aerial photograph and still no visual evidence of any water channel upslope of our property.

The ephemeral stream channel in the power line on the lower right edge of the photograph is still quite visible.

Source: USDA Historical Aerial Photos 3MM_129.tif

1981 Aerial Image of Area Upslope from Ditch on Our Property

22 years later, still no evidence of any water channel upslope of our property.



The ephemeral stream channel in the power line on the lower right edge of the photograph is still evident in the same location as on the 1959 photo.

Source: Wake County iMaps GIS

1988 Aerial Image of Area Upslope from Ditch on Our Property

In 1988 there is clear evidence of a ditch having been dug since the 1981 photo was taken.

Note the relatively straight nature of the cut, lack of sinuosity.

A close-up view of the original aerial photo will reveal further evidence of spoil piles excavated from ditch.

Source: Wake County iMaps GIS

1999 Aerial Image of Area Upslope from Ditch on Our Property

Improved clarity of photograph emphasizes the straight cut and lack of sinuosity of the ditch. A close-up of the original aerial photo would reveal better clarity of spoil piles excavated from ditch.

Source: Wake County iMaps GIS

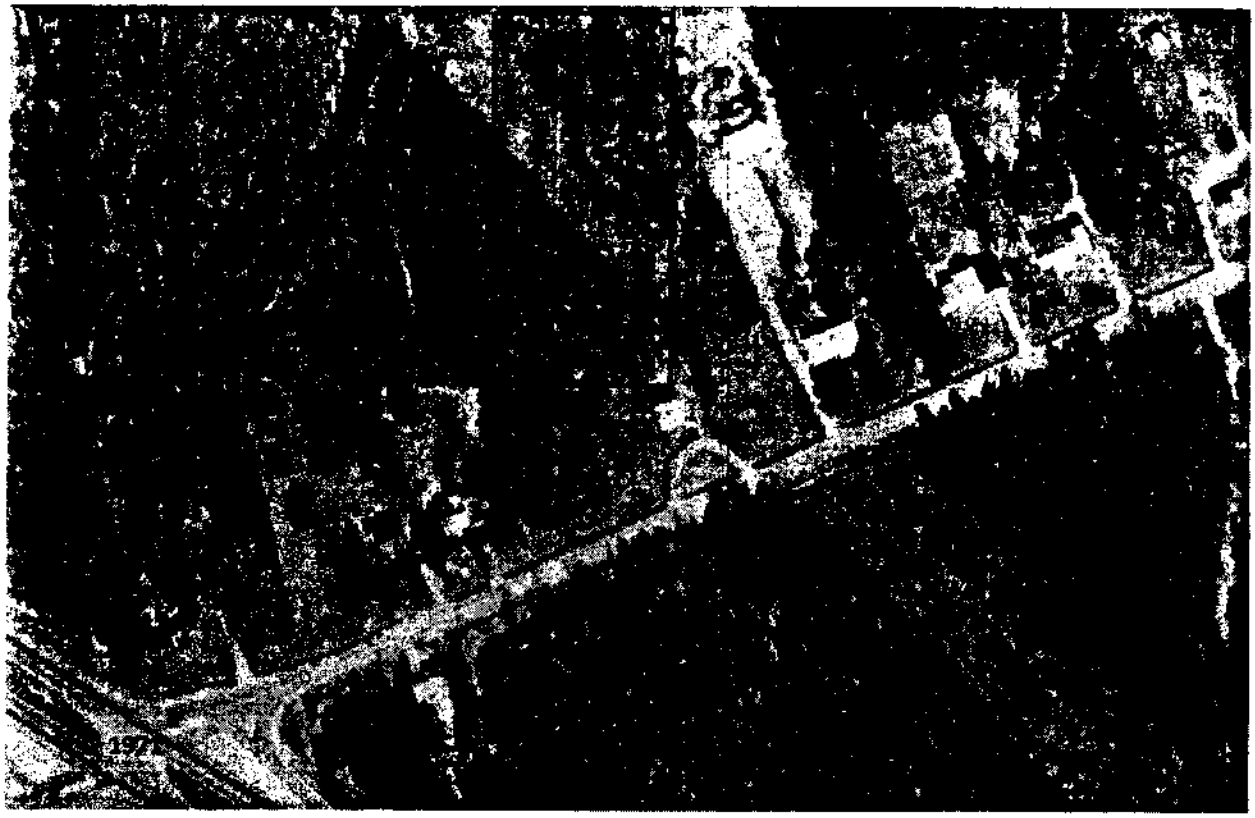
2005 Aerial Image of Area Upslope from Ditch on Our Property

This version provides an even better view of the well-formed, straight cut. No doubt about it here.

Source: Wake County iMaps GIS

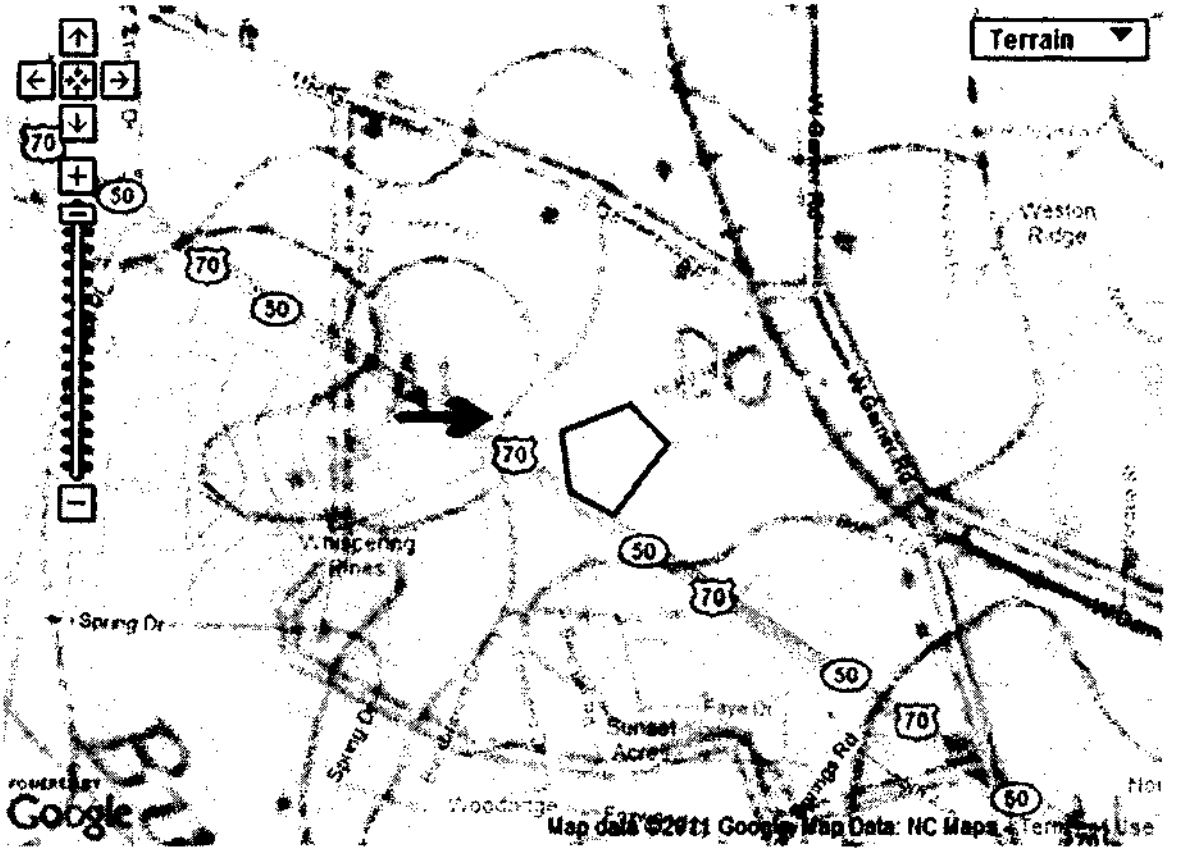
Remember the lack of visual evidence on the 1971 photo?

Here is the 1971 photo again for comparison.



Source: USDA Historical Aerial Photos 3MM_129.tif

While we are looking at Soil Maps, here is a copy of the 1914 version



Notice that there is only one stream feature on this map. It crosses the US 70/Yeargan Road intersection west of the intersection.

Our property lies east of this intersection. **This original stream location does not cross our property.**

The 2nd feature that crosses our property today was added after this 1914 map was published.

Original map: "Soil map, North Carolina, Wake County sheet ." Washington, D.C.: U.S. Bureau of Soils and North Carolina Department of Agriculture, 1914. North Carolina State Archives call number MC.099.1914b.

http://dc.lib.unc.edu/u?/ncmaps,301

Source: UNC Maps Archive

NCDWQ Basic rules for making stream determinations

- ***Do not evaluate a stream within 48 hours of rainfall that results in surface runoff.***
- ***Review information on stream to be evaluated.***
- ***Become familiar with the characteristics of headwaters streams in the region of interest.***
- ***Walk to the upstream extent of the feature when feasible.***
- ***Evaluate at least 100 ft. of stream to determine average conditions.***

Remember however, if the feature is a ditch, no determination is necessary.

Based on my experience, this is What NCDWQ Typically Does

- ***Pull the 1970 Wake County NRCS Soil Map and the 1998 USGS Quadrangle map for the property area.***
- ***Locate property on both maps.***
- ***If either of these maps indicates that a stream is present on the property, schedule a site visit to do a stream evaluation.***
- ***At the site, walk the length of the water feature on the subject property, observing the Stream Identification Method indicators that might be present, sometimes using a stream evaluation form, sometimes not.***
- ***Make a determination that the stream is subject or not subject to the buffer restrictions.***

This may be sufficient in the majority of their cases, but not always.

Based on my experience, this is What NCDWQ Typically Does NOT Do

- ***Review additional information on the feature to be evaluated.***
    - ***Only the NRCS Soil map and the USGS maps are used.***
    - ***The following were <u>not</u> considered prior to our site visits:***
        - ***High resolution topographic data (e.g., LiDAR-based) and aerial photography are not considered.***
            - ***Historical aerials were very important in this determination. They were not used prior to evaluation.***
        - ***Other important data may include land use/land cover or current construction activity in the area.***
        - ***To assist in evaluating whether flow in the stream is typical, current stream flow at nearby gauges, recent rainfall compared to normal, and drought status information is useful.***
- *Walk to the upstream extent of the feature, towards the ridge top until certain that the entire drainage way to its origin has been observed.*
- *Consider whether the feature is natural or manmade.*
    - *If it appears on **either** the NRCS or USGS maps, they have already determined that it is a stream, before visiting the site. All that is left, in their mind, is to determine whether the **stream** is ephemeral, intermittent or perennial.*
    - *Evidence of extensive excavation along the feature's length, will be considered evidence that it is a "modified natural stream", since the only other alternative is that it is a ditch.*
- *Research whether or not there were previous site determinations on similar nearby features that might be relevant to the status of this property.*

- *A previous determination was made on a stream on an adjacent parcel that was relevant to the determination on our property. This was not considered until pre-trial discovery.*

Other Evidence That the Feature is a Ditch, Not a Natural Stream.

Assessment Note on Wake County Revenue Website, dated 11-17-1989, indicating that the feature is a "Ditch".

Home

Wake County Real Estate Data
Assessment Notes

iMaps
Tax Bills

Real Estate ID 0001081 PIN # 1711052372

WAKE COUNTY NORTH CAROLINA

Location Address
0 YEARGAN RD

Property Description
LO3 M A ALEXANDER SR EST

Account Search

Pin/Parcel History Search Results New Search

Account | Buildings | Land | Deeds | Notes | Sales | Photos | Tax Bill | Map

Card 01 Of 01 Code Descriptions

Date	Line	Notes
04-08-2009	1	boe consent
12-30-1999	1	IH-C/LV/GKW/12-30-99/LAND VALUE/RATE ERROR LAND COND OF N-40 =
12-30-1999	2	SIZE, WET AND CREEKS
04-06-1993	1	APPEAL WITHDRAWN-AGREED TO CONSENT VALUE ON 4-2-93 F93/DCO
04-06-1993	2	WASTE=.23AC FOR CP&L EASEMENT
02-01-1993	1	APPEAL FORM MAILED 2-2-93/PS
11-17-1989	1	DITCH ON PROP NOT PRATICAL FOR BLDG TILL FILLED IN

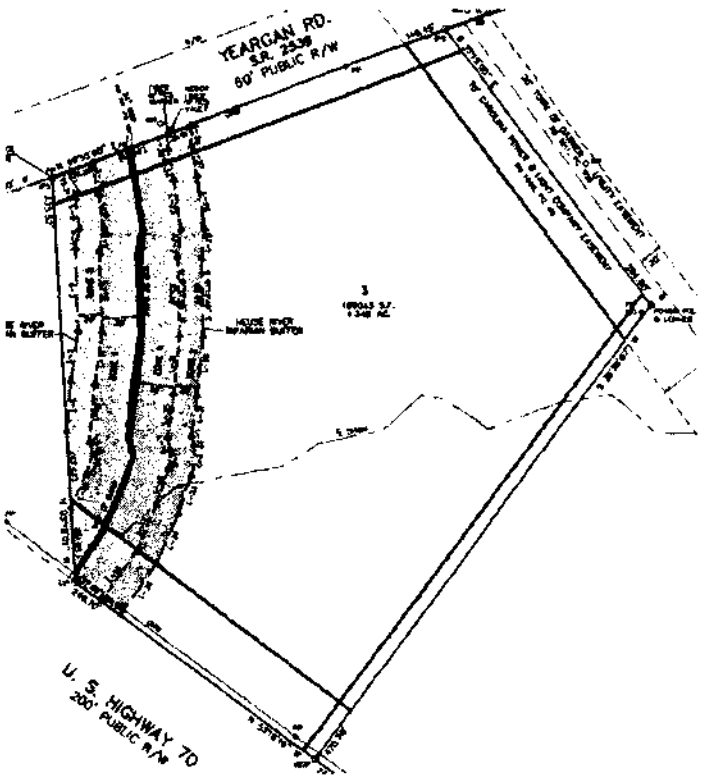
Source: Wake County Revenue Website: Real Estate Data Assessment Notes

Why This Site Required More

- *Circa 1970, the existing short, shallow ditch was radically excavated. Spoil piles still there*
- *Dug down to the bedrock, nearly 6 feet below the bank on the upslope end, to only a few inches above the bank on the down slope end, resulting in almost no slope along the bottom of cut.*
- *Dug straight through from Yeargan Road to connect with natural stream near US 70, only turning to avoid large trees in the path. No sinuosity.*
- *Original ditch bed completely obliterated. No way to tell what existed there previously by examining the feature in the cut.*
- *The only way to truly understand the nature of this feature prior to the excavation is to:*
    - *Compare to the feature upslope that supplies runoff.*
        - *Sources of water for the ditch are the upslope ditch, the runoff from the ditches on either side of Yeargan Road, and the drainage into the ditch from the ground that borders the ditch.*
        - Much deeper than ditch on other side of road.
    - *Consider drainage ditches that empty into cut.*

    - *Yeargan Road ditches show little sign of erosion, even though they have been there for over 50 years. Grass growing in the bottom and on the sides of the ditches gives an indication of the average runoff.*
    - Uniform depth, width throughout. Much wider, deeper than volume of water would indicate.
- *Consider slope of surrounding and adjacent land contours for clues to location of natural stream beds vs. ditches.*
    - *Natural slope of the parcel is toward the natural ephemeral stream, not toward the ditch.*
    - *Spoil piles along the length of the ditch on both sides, divert surface runoff away from ditch.*
    - *Ditch's primary function is to carry the runoff from Yeargan Road and the properties across Yeargan Road from the parcel.*
- *Consider the composition of the bordering land surfaces.*
    - *Clues to historic flooding of bordering land when previous ditch could not contain the runoff, indicating that the current channel cut did not exist.*

Why does it matter?



The Neuse River Buffer will remove approximately 1 acre of the property from ***any*** future development.

This loss is in addition to loss from existing easements and setbacks

* Progress Energy power line
* Garner water & sewer lines bordering property on Yeargan.
* 30' setback from Yeargan Rd
* 50' setback from US70
* 10' setback from adjoining property lines

Plus additional environmental protection area restrictions required for development such as retention ponds, etc.

Can't you just get a Variance and pay a Mitigation Fee to use the property?

Mitigation fees for the entire 350' length of the water feature will cost us approximately $225,000.

This is a heavy price to pay for a feature that should not be subject to the buffer rule anyway, since it is a ditch and not a stream.

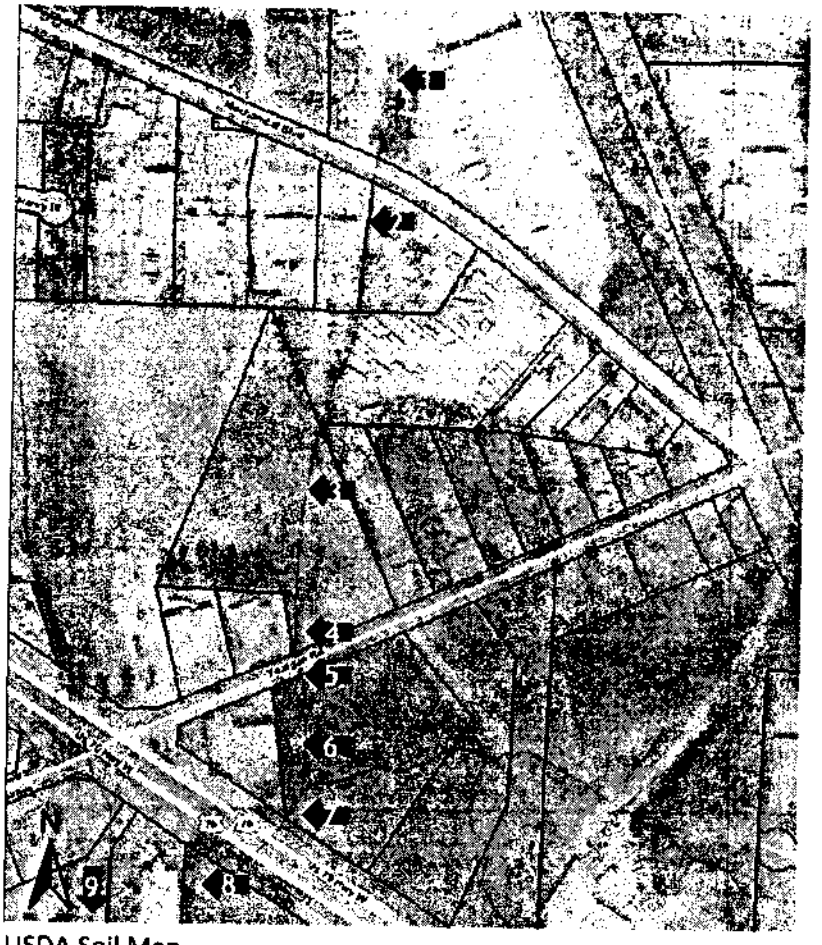
What evidence is there that this is a stream?

- This feature appears on the 1970 NRCS Soil map...

What evidence is there that this is NOT a stream?

- *Not on the 2002 USGS map.*
- *Not on the NCFMS LiDAR map.*
- *Extensive Aerial Photography (1938-2010) showing no stream historically present upslope of property.*
- *1914 Soil Map showing a single stream crossing what will become US 70 right of way, west of our property*
- *Testimony of ditch-like nature and flooding on surrounding soil.*
- *"It is nothing but a little wet weather branch." – Dr. Bobby Raynor, owner of upslope property when asked about the ditching of the channel that is the source of the ditch on our property.*
- *Lack of erosion on upstream feature and drainage ditches.*
- *Drastic difference in nature of feeder feature upslope and on property. Not attributable to erosion.*
- *Natural crenulations of contours on adjacent natural stream vs. artificial contours of this ditch.*
- *After over 40 years since the excavation, spoil piles are still all along the banks indicating extensive excavation all the way to the intersection with ephemeral stream*
- *After over 40 years since the excavation, spoil piles still exist the entire length of the cut, all the way to the natural, ephemeral stream intersection.*
- *At the point where the ditch intersects the ephemeral stream, substantial spoil piles are present.* ***This is a clear indication that dirt had to be removed to create the channel, and that there was no pre-existing natural channel intersecting with the ephemeral stream.***

The photos on the following slides were all taken on the same day, along the path that is depicted as an "unclassified intermittent stream" on the 1970 USDA Soil Map shown earlier in this presentation.



USDA Soil Map.

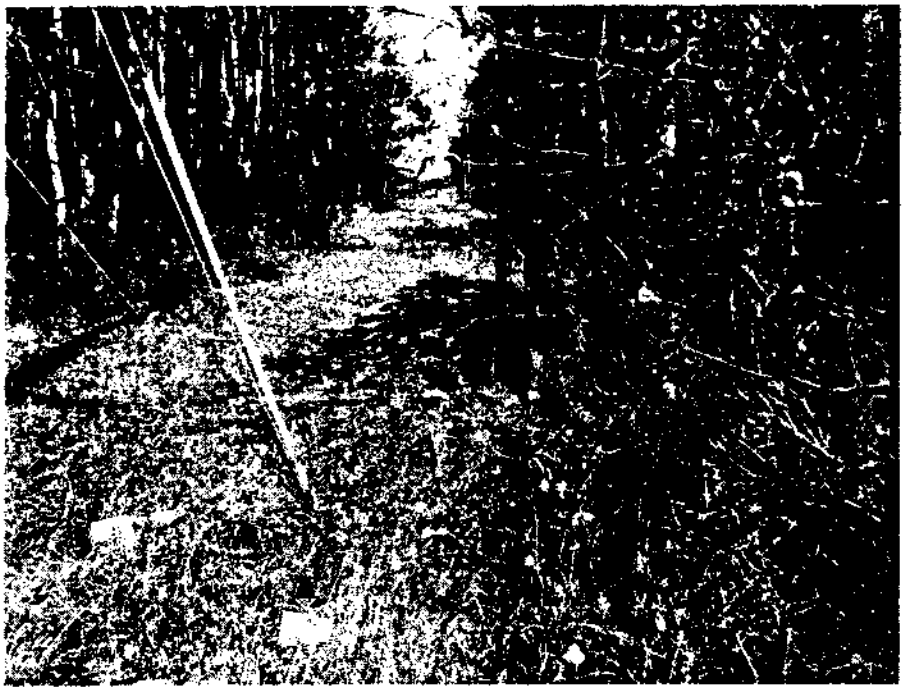
The series of photographs begins north of Mechanical Blvd (1) near the location indicated as the origin of the unclassified intermittent stream feature.

They continue just south of Mechanical Blvd through the industrial warehouse district (2), then southward crossing the Raynor property (3 & 4), before crossing Yeargan Road onto the Alexander property.

The photos then progress along the ditch on the Alexander property (5, 6, & 7) to US70.

After crossing US70, there are photos south of the highway where the flow runs under the Garner TV & Appliance building (8), the final photo taken south of that structure near the point of origin shown on the USGS and LIDAR maps (9).

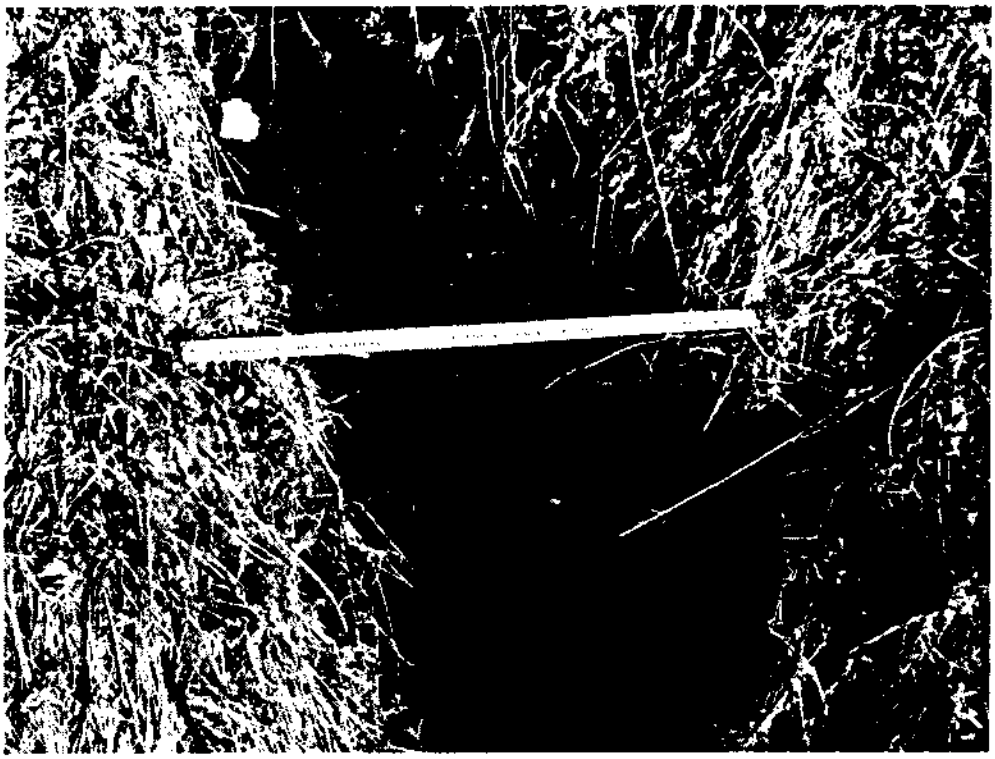
North of Mechanical Blvd, near location of stream origin on 1970



This is just south of Mechanical Blvd in Industrial Warehouse District. This is the ditch that collects the Mechanical Blvd runoff that flows into it from the ditches on either side of the road.

This is a close up shot of the ditch as it crosses the Raynor property north of our property. The width of the ditch here is approximately 18"-20".

(I accidentally broke about 6" off the tip of the yardstick earlier that day while shooting the pictures).



This is a picture of the ditch farther downslope on the Raynor property, just before it flows into the pipe underneath Yeargan Road.

A quick shot of the ditch on the side of Yeargan Road, looking upslope from the intersection with the ditch on the Alexander property. This is to help you visualize the smooth, non-eroded quality of the feeder ditches at the Yeargan Road intersection point.

A close up of the pipe after crossing underneath Yeargan Road from the Raynor property. *Notice the trickle of water exiting the pipe.*

The massive ditch cut in the Alexander property looking north toward Yeargan Road. The pipe visible in the upper right area of the photo is the same 24" concrete pipe shown in the close-up on the previous slide.

Before we move on, take a quick second look at the ditch and pipe on the Raynor property north of Yeargan Road, compared to the ditch immediately across the road on our property.

Here's another shot looking north toward Yeargan Road from a point farther south.

Notice the straightness of the cut from north to south along its length. This is near the point **where the original ditch channel ended.**

Also remember that the original channel that stopped here was much, much shallower and far narrower than the channel you see here now.

A final shot looking northward toward Yeargan Road from even farther south, further illustration of the ditch's straight cut along its length.

I think it is also important to point out here that the amount of water present is not normal.

These photos were taken after several weeks of the record cold temperatures that we experienced in January this year.

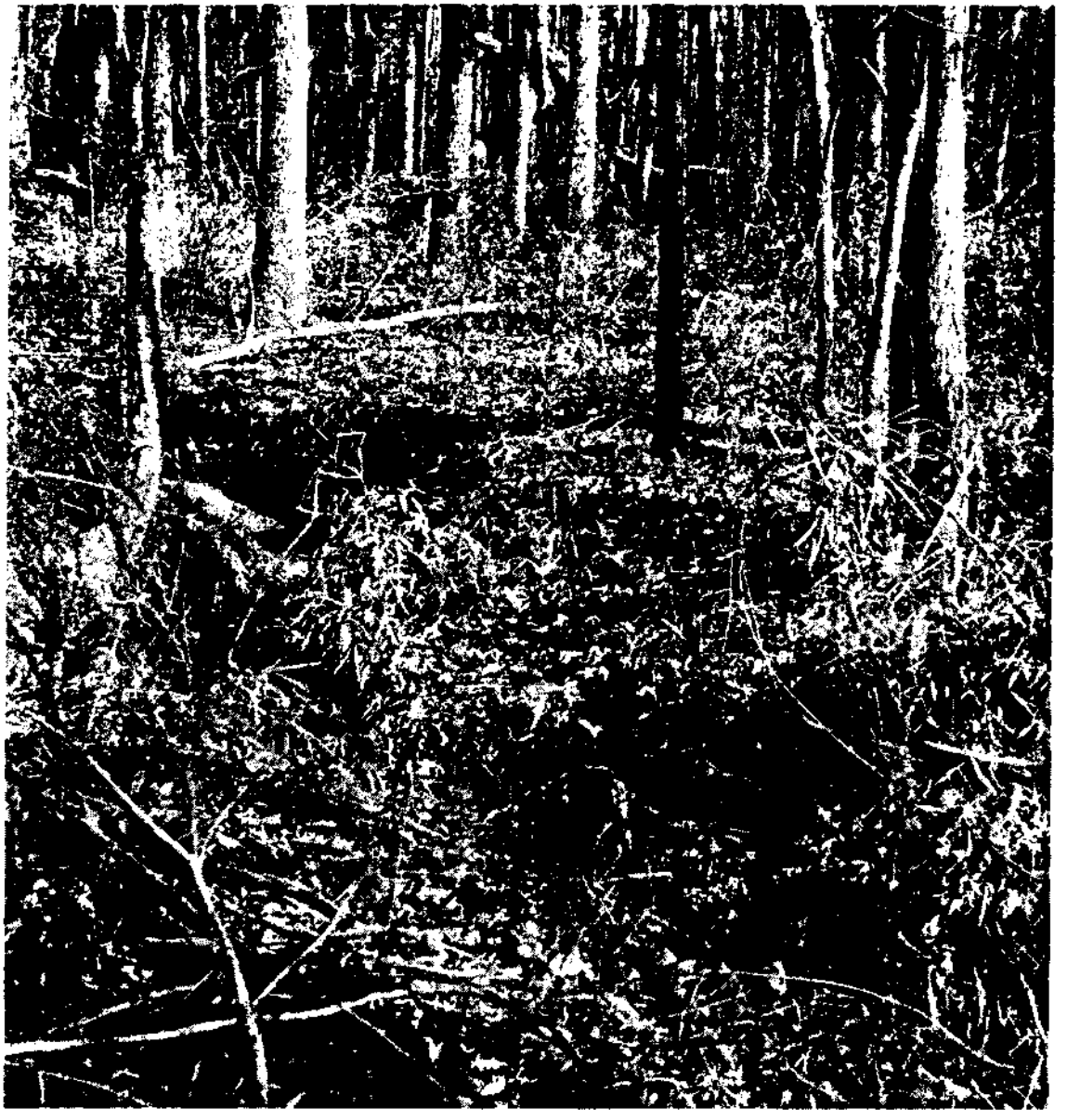
The ground was hard frozen and virtually all of the precipitation that had fallen in the previous weeks had frozen in place and that still in liquid form was standing on frozen ground.

Looking South:

Here are two shots, still on the Alexander property, facing in the opposite direction, southward toward US70.

The uniform, ditch-like quality of the feature is still obvious as it heads downslope toward US70.

By comparison, here's a shot of the terrain bordering the ephemeral stream.



This is near the point close to US70 where the artificial ditch channel was dug out to intersect with the ephemeral stream.

Because of the thick undergrowth, I could not get a good shot of the point where the ditch runs into the ephemeral stream. However, this is a point just south of their intersection, showing the undisturbed portion of the natural stream bed downstream from the junction, just before flowing under US70.

Only a few feet south of the previous slide. Here's a photo of the natural stream bed and the 2" of water standing in it, immediately before flowing under US70.

Looking south from the same position as the previous slide, here's a shot of the entrance to the pipe that carries the water under US70.

After crossing under US70, **the water actually flows underneath** the Garner TV & Appliance building.

Here's a close-up photo of the entrance pipe that carries the water underneath the Garner TV & Appliance building south of US70.

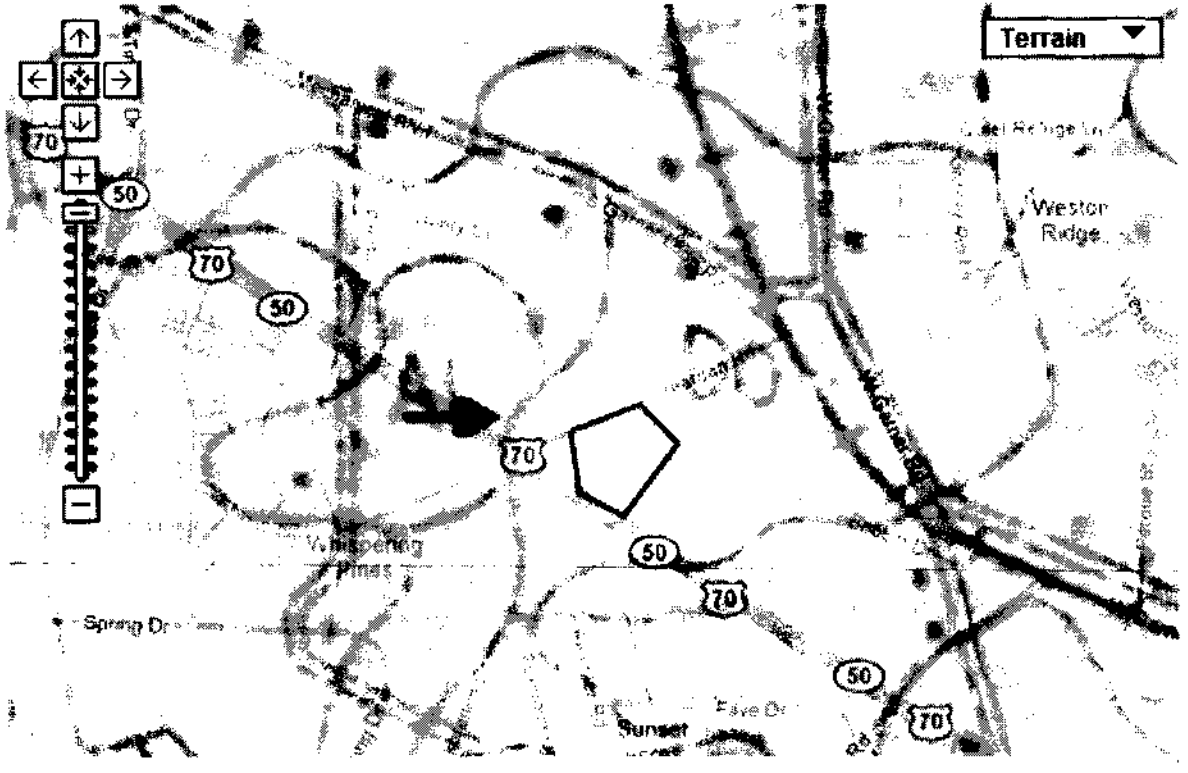
Here's the pipe exiting from under the Garner TV & Appliance building.

Shot from the same position as the previous slide, facing 90° to the right (downslope) from the previous slide.

Although the spoil piles don't show up as well in a photo as onsite, you are still able to see the mounds in these and the following photo.

The mounds are clearly visible, but there are some things you cannot see in the photo. Beyond the mounds there are still traces of the surface flow patterns where the overflow ran from the termination point of the original ditch, over the land to the low lying area to the south.

Loop Rd
Henry Dr
Mechanical Blvd
Yeargan Rd
70
Loop Rd
Yeargan Rd
Us 70
Hwy W
Us 70
Hwy W
70
Coldwater Dr



Original map: "Soil map, North Carolina, Wake County sheet ." Washington, D.C.: U.S. Bureau of Soils and North Carolina Department of Agriculture, 1914. North Carolina State Archives call number MC.099.1914b.

http://dc.lib.unc.edu/u?/ncmaps,301

http://www2.lib.unc.edu/dc/ncmaps/interactive/MC_099_1914b.html

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